

an inner member mounted within the outer member for movement relative to the outer member, the inner member defining an opening for receiving the drive arm.

*Sub F1* 46. The piston assembly of claim 45 further comprising a universal joint connecting the transition arm to the stationary support.

a 47. The piston assembly of claim 45 wherein the outer member is configured for movement relative to the first and second elements along a first axis perpendicular to the common axis.

48. The piston assembly of claim 47 wherein the outer member is configured for movement relative to the first and second elements along a second axis perpendicular to the first axis and the common axis.

49. The piston assembly of claim 47 wherein the inner member is mounted within the outer member for rotation relative to the outer member about the first axis.

50. The piston assembly of claim 47 wherein the inner member is coupled to the outer member for controlled motion along the first axis with the outer member.

*Sub D1* 51. The piston assembly of claim 45 wherein the joint is configured such that the drive arm received in the joint is rotatable about an axis of the drive arm.

*Sub F1* 52. The piston assembly of claim 45 wherein the outer member is configured for movement relative to the first and second elements along first and second orthogonal axes perpendicular to the common axis, and the inner member is mounted within the outer member for rotation relative to the outer member about the second orthogonal axis.

*Sub D1* 53. The piston assembly of claim 52 wherein the joint is configured such that the drive arm received in the joint is rotatable about an axis of the drive arm.

*Sub E1* 54. The piston assembly of claim 45 wherein the outer member defines first and second parallel flat sides, each flat side defining a plane perpendicular to the common axis.

*a1* 55. The piston assembly of claim 54 further comprising first and second sliding members, the first sliding member for positioning between the first flat side and the first element, the second sliding member for positioning between the second flat side and the second element.

56. The piston assembly of claim 54 wherein the first and second flat sides each comprise a polished surface.

57. The piston assembly of claim 45 wherein the first and second elements each comprises a piston.

58. The piston assembly of claim 45 wherein the first element comprises a piston and the second element comprises a guided rod.

*Sub B2* 59. The piston assembly of claim 45 wherein the drive arm defines a longitudinal axis, the joint further comprising a mount for holding the drive arm axially stationary while permitting the drive arm to rotate about its longitudinal axis.

*Sub E1* 60. The piston assembly of claim 59 wherein the mount comprises a cap screw.

*Sub B3* 61. The piston assembly of claim 45 wherein the opening in the inner member comprises a channel defining a channel axis perpendicular to the second axis.

*Sub E1* 62. The piston assembly of claim 45 wherein the opening in the outer member comprises a slot for accommodating movement of the drive arm when the inner member rotates relative to outer member.

63. The piston assembly of claim 45 further comprising a thrust bearing for receiving an axial load transferred to the drive arm by the first and second elements.

64. The piston assembly of claim 45 further comprising a sleeve bearing for receiving a normal load transferred to the drive arm by the first and second elements.

65. The piston assembly of claim 45 further comprising a bearing located between the inner and outer members.

a 66. The piston assembly of claim 45 further comprising a connector for mounting of the first and second elements thereto, the connector defining a cavity, the outer member and the inner member being positioned within the cavity.

67. The piston assembly of claim 45 wherein the outer member is formed as a single component.

68. The piston assembly of claim 45 further including at least two double ended members and at least two drive arms.

69. A piston assembly, comprising:  
a plurality of double ended members, each double ended member having first and second elements configured for linear motion along a common axis, at least one of the first and second elements being a piston,  
a transition arm coupled to each of the double ended members, the transition arm including a plurality of drive arms, each drive arm defining a drive arm axis,  
a plurality of joints, each joint for coupling one of the plurality of drive arms to a respective one of the double ended members, each joint providing degrees of freedom in four directions between the transition arm and the respective double ended piston, the four degrees of freedom being rotation about the drive arm axis, sliding along the drive arm axis, pivoting about an axis perpendicular to the drive arm axis, and sliding in the direction of the perpendicular axis, and  
a universal joint connecting the transition arm to a support.

70. A piston assembly, comprising:  
a plurality of double ended members, each double ended member having first and second elements configured for linear motion along a common axis, at least one of the first and second elements being a piston,

a transition arm coupled to a stationary support, the transition arm including a plurality of drive arms, each drive arm defining a drive arm axis, and

a plurality of joints, each joint for coupling one of the plurality of drive arms to a respective one of the double ended members, each joint providing degrees of freedom in four directions between the transition arm and the respective double ended piston, the four degrees of freedom being rotation about the drive arm axis, sliding along the drive arm axis, pivoting about an axis perpendicular to the drive arm axis, and sliding in the direction of the perpendicular axis.

71. The piston assembly of claim 70 further comprising a universal joint connecting the transition arm to the stationary support.

72. A piston assembly, comprising:  
a plurality of double ended members, each double ended member having first and second elements configured for linear motion along a common axis, at least one of the first and second elements being a piston,

a transition arm coupled to a stationary support, the transition arm including a plurality of drive arms, each drive arm defining a drive arm axis, and

a plurality of joints, each joint for coupling one of the plurality of drive arms to a respective one of the double ended members, each joint providing rotation about the drive arm axis, and sliding in the direction of at least one of first and second orthogonal axes perpendicular to the drive arm axis.

73. The piston assembly of claim 72 further comprising a universal joint connecting the transition arm to the stationary support.

74. The piston assembly of claim 72 wherein each joint provides sliding in the direction of both the first and second orthogonal axes.

75. A piston assembly, comprising: